

JOINT DISTRIBUTED VIRTUAL COMBAT RANGE

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Introduction

Recent combat actions, most notably Operation Allied Force, showed pronounced shortcomings in Army and Air Force joint training and interoperability. The Kosovo/Operation Allied Force After Action Review noted that Operation Allied Force validated the need for joint, integrated training and underscored the criticality of interoperability training. In fact, this need is clearly evident in the Joint Surveillance Target Attack Radar System (JSTARS) Program. Although the Army and Air Force have solved many JSTARS training and interoperability issues, difficulties still remain, especially for the Common Ground Station (CGS). Realizing this, a team of government and industry experts developed the Joint Distributed Virtual Combat Range (JD-VCR). This virtual battlefield lays the foundation for solving joint training, testing, and mission-

rehearsal issues for the CGS and future network-centric warfare systems.

Why A Virtual Range?

The CGS comprises a “system-of-systems” using a number of joint sensors and communication links. The primary sensor is provided by the JSTARS—an Air Force operated asset that gives the joint task force commander a wide area surveillance capability. Joint warfighters from regiment and brigade up through theater rely on the CGS to support their diverse targeting and combat information needs. CGS crews need frequent opportunities to work with joint staffs and full sensor arrays to maintain their skills. Opportunities to do this are limited because of the lack of appropriate-size ranges, transportation dollars, and operational and personnel tempos.

Training

The primary reason for a JD-VCR is the lack of live and simulated exercises that address joint interoperability training at the tactical level, specifically at the division level and below. The U.S. Joint Forces Command (JFCOM) recognized this deficiency in its *Final Report on the Training Center for Joint Interoperability (JI) Study*. The report states, “. . . only a few selected units get the opportunity to conduct joint interoperability training; when they do, it is not enough to advance beyond the ‘crawl’ stage.”

At the simplest level of joint interoperability, CGS crews have difficulty sustaining skills that enable them to maintain linkage with the JSTARS aircraft. This is attributable to the lack of training opportunities. For example, high-density E-8C flight sites such as Fort Bragg are only able to link with the JSTARS aircraft about

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three times a month for about an hour each time. In addition, low-density flight sites may only be available once a quarter or less. During these training opportunities, the JSTARS radar is normally looking at civilian traffic on local highways, providing little or no tactical training value for intelligence analysts and targeting staffs. Commanders find it difficult to quantify this type of ad hoc training using the Army's formal teaching process of "tasks, conditions, and standards." More complex levels of training are offered during National Training Center rotations and at warfighter exercises, but these occur only once every 2 years. What CGS crews and their warfighting staffs need are monthly opportunities to work with JSTARS and other members of the joint "kill chain."

Testing

Operational testing requirements for systems-of-systems like the CGS mirror those of joint interoperability training. The JFCOM report states, "The testing and evaluation community has requirements similar to those of the training community in the areas of simulation, network infrastructure, and data collection, and the need for operational forces to validate capabilities and systems as would be employed in joint interoperability training exercises." Like the training community, the CGS operational test community faces the same hurdles.

Mission Rehearsal

CGS mission rehearsal in support of real-world operations also suffers from the inability to synchronize garrison forces from dispersed locations. The JFCOM echoes this point for many systems-of-systems, "... in many cases the only opportunity to train the joint force is between the time the joint force is activated and when it must engage the enemy in battle!" This situation will rarely result in a properly rehearsed joint operation.

JD-VCR

With the concerns of training, testing, and mission rehearsal in mind, the components of the JD-VCR began to take shape in concept and scope. The first component is the virtual battlespace or "hub." The hub must meet the operational needs for all of the Services. In addition, it must meet the fidelity of the entire customer base, most specifically the stringent requirements of the test and evaluation community. Finally, the hub must be affordable and supportable.

At first, the modeling and simulation (M&S) team sought to build a virtual battlespace from scratch. Initial cost estimates looked unaffordable until the CGS M&S team discovered the Theater Aerospace Command and Control Simulation Facility (TACCSF) at Kirtland AFB, NM. This high-tech, \$250 billion facility quickly became the top choice for the joint hub. The new Air

Force Chief of Staff recently designated TACCSF as the joint distributed training hub for the Air Force. This facility already has an integrated network of simulators, a robust infrastructure, and expertise in place for distributive simulation training. TACCSF currently maintains a close working relationship with the 93rd Air Control Wing (JSTARS) and conducts quarterly exercises called "Desert Pivots" or "Virtual Flags." The Desert Pivot exercises focus on battle management and work every piece of the air component kill chain from target detection, to target attack, to battle damage assessment. While TACCSF primarily supports Air Force needs, it eagerly supports expansion into the joint arena. According to LTC James "Boomer" Henry, TACCSF Director, "The ground and air components have to learn to work together, and we think that this is the perfect venue to do that."

To fulfill the role envisioned by the CGS M&S team, TACCSF agreed to have the Army integrate some of its own simulation and digital communication capabilities into the TACCSF federation. These include FIRESIM (Indirect Fire Support Simulator), a dismounted version of the CGS called the Joint Service Work Station, an All Source Analysis System (ASAS), and an Advanced Field Artillery Tactical Data System (AFATDS). In addition, the TACCSF supports establishment of a permanent Army presence within its facility. This Army cell will bring the ground component to the fight during the quarterly Desert Pivot exercises. It will also manage the monthly, distributed training events (3-5 per month) that run on the virtual combat range.

Having identified the hub, the team then shifted its attention to putting together the network that would tie the hub to the player units around the world. The team anticipated that this could be the costliest piece of the virtual combat range, and might in fact be cost prohibitive. Fortunately, the CGS M&S team discovered that the National Guard

Bureau (NGB) already has a network in place and is willing to share it. The NGB calls this the Distributive Training Technology Project or "GuardNET XXI."

GuardNET XXI is an existing network of T-1 lines and DC-3 circuits that provide integrated voice, video, and data products to all 50 states and 4 U.S. territories. The network supports hundreds of high-tech digital classrooms where soldiers train. Fortunately for the CGS M&S team, most of these classrooms are in close proximity to Active duty CGS garrisons. The partnering of GuardNET XXI with the JD-VCR also helps solve Army National Guard (ARNG) training issues. If joint interoperability training is difficult for the Active duty force, it is exponentially more difficult for the 15 ARNG units that are scheduled to receive CGSs beginning in FY02. The NGB agreed to allow the CGS M&S team to use its GuardNET XXI as long as the JD-VCR accommodates the unique training needs of the ARNG.

The final piece for the CGS M&S team to put in place was the outstation locations or "Warrior World." The team's intent here is to set up an infrastructure that allows the CGSs and their staffs to roll-up and plug right into the virtual combat range. The CGS M&S team also needed to make the sensor and communications linkages as real as possible because link maintenance is one of the identified training deficiencies.

Instead of injecting simulated E-8C radar data directly into each CGS, this information is broadcast over an emulator that physically replicates the data link on the aircraft. Each CGS will receive JSTARS information via its actual ground data terminal. Unmanned aerial vehicle (UAV) telemetry and video information is brought into the CGS via a MetaVR simulator that replicates the UAV Ground Control Station (GCS). When the actual Tactical UAV GCS becomes available, it will

be able to easily integrate into the virtual battlespace because MetaVR is built into its software. The CGSs will receive intelligence broadcast services via the Commander's Tactical Terminal or Joint Tactical Terminal via the actual links using a training format. Outstation CGSs will be able to link with ASAS and AFATDS terminals locally or with these systems at the TACCSF via GuardNET XXI. The M&S team plans to have nearly 40 outstations plugged into the VCR.

Evolutionary Approach

Using quarterly Desert Pivot exercises as "waypoints," the CGS M&S team is taking an evolutionary approach to building the VCR. The intent is to use the quarterly Desert Pivot exercises to incrementally grow the JD-VCR. At each step, the customer base of trainers, testers, and mission planners will be able to assess the performance of the range to support their specific areas of interest.

The crawl phase (concept viability) of the JD-VCR occurred in April 2001. During a Desert Pivot exercise, five CGSs from the U.S. Army Intelligence Center and School at Fort Huachuca, AZ, participated in a southwest Asia scenario. The Fort Huachuca CGSs interoperated with a simulated E-8C aircraft manned by a real JSTARS aircrew at Kirtland AFB. The CGSs also received UAV telemetry/imagery from the Army's Hunter UAV and used their voice communications over the network.

By the time this article is published, the team will have completed the "walk" stage (GuardNET XXI viability) at Desert Pivot 01-4 in September 2001. The CGS from the Army's newest unit, the Interim Brigade Combat Team (IBCT) at Fort Lewis, WA, will join the JD-VCR by linking into GuardNET XXI. As such, the IBCT will monitor JSTARS and UAV operations from its Fort Lewis location. In addition, the Army's Intelli-

gence Center will establish a digital tactical operations center to support its CGS and its schoolhouse. The M&S team will also equip the TACCSF with an AFATDS system to test the digital messaging capability of the JD-VCR.

The CGS M&S Team plans to reach the "run" stage in the summer of 2002 to include the ARNG during another Desert Pivot exercise. The team hopes to be executing all or portions of the CGS's follow-on test and evaluation on the JD-VCR in the first quarter of 2004. The CGS team also envisions that the JD-VCR will evolve beyond just the CGS. In fact, the JD-VCR has the potential to become a fundamental component in the development, testing, and training of the Distributive Common Ground System-Army (DCGS-A).

The New Vision

At its end state, the JD-VCR will enable CGS crews and warfighting staffs to hone joint interoperability skills, rehearse complex military operations, and train in realistic combat environments without leaving their home stations. The JD-VCR will also provide the test and evaluation community a cost-effective venue and tools to assess systems-of-systems like the CGS and the future DCGS-A.

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